Is it true that nonresponse rates in a panel survey increase when supplement surveys are annexed?

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Is it True that Nonresponse Rates in a Panel Survey Increase when Supplement Surveys are Annexed?

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Abstract: *It is usually assumed that there will be an increase in nonresponse, especially for refusals, when a greater burden is imposed on the respondents. The paper deals primarily with the issue relating to how nonresponse rates of a current panel survey are affected by the additional burden arising from appending supplement surveys. A long-term analysis of the nonresponse rates in the Israeli Labour Force Survey (LFS), by main types of nonresponse, is used for this study. At the same time, some other effects are studied, such as that of the mode of data collection and of the season of the year. The assumption of a decrease in the response rates with the number of rounds is examined to a limited extent.*

Keywords: *annexed survey, interviewing mode, interviewer workload, nonresponse, panel survey, respondent burden, supplement survey*

1 Introduction

In general, the assumption is that when a greater burden is imposed on the respondents, there will be an increase in the nonresponse rates, especially for refusals. The longer the questionnaire and the more the number of interviews in a panel or a longitudinal survey, the greater is the burden. In order to reduce potential nonresponse bias, there is a tendency to lessen the burden, despite the advantages of conducting a survey with a longer interview, or with more repeated interviews.

However, there is no conclusive evidence in the literature to support this assumption. Bogen (1996) gives a comprehensive review of the existing literature, dealing mostly with mail surveys, though covering a few studies relating to other types of surveys. She quotes Berdie (1973), who earlier made a review of the research done on this issue, and concluded that "surprisingly few studies actually have examined correlations between length of questionnaires and rate of response, and those studies that have done so generally have yielded confusing results". Bogen also finds that, the results are still not

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conclusive: "they are confusing and contradictory... and designers still aim for shorter questionnaires with little more justification than the logical assumption that longer interviews will result in higher nonresponse".

A specific case of a greater burden is when a current rotating panel survey, like many Labour Force Surveys (LFS's) over the world, is used as a convenient tool for conducting supplement surveys (though only with a reasonable extra burden). These may be annexed to one or more rounds, of all or some of the panels, either occasionally or on a regular basis.

The primary advantage of conducting a supplement survey appended to a current survey is that of cost. It will be less than for a separate survey, since no expense of separate sampling and of organizational infrastructure will be incurred. Also, the additional interview will be shorter, because some of the data collected in the current survey will anyway be required for the supplement survey. Beside cost considerations, further gains can be achieved in improving data processing, imputation and weighting in the supplement survey.

Against these advantages, there is a concern of unfavourable effects on the response rate, especially for refusals, in both surveys. This may be even more serious when the supplement survey is prone to a relatively high refusal rate. Because usually preference is given to the current survey, the annexed questions are left until the end of the interview. When the survey is annexed to one of the intermediate rounds of the current survey, there is concern that this may harm the following interviews. Therefore, there is a tendency to hold heavy supplement surveys in the last round. Furthermore, because there is a fear of harming the current survey, sometimes a separate survey is conducted, although it would have been better to annex it to the current survey.

With supplement surveys, there may be either direct or indirect impact on the interviewer's workload (Marquis (1979)). Usually, the interviewer's quota is about the same for all rounds, and they have to cope with the additional time required for the extra interview. So, less time can be allocated to deal with hard-to-get respondents, thus may affect negatively the response rate of the current survey. Also, it could be that because interviewers expect a negative reaction for a long interview, they do not try as hard as they could.

Supplement surveys may have different degrees of burden on the respondent and on the interviewer workload. These depend on the length of the additional interview, on the type of the questions and on the mode of data collection, e.g. a personal interview of all or some of the household members, or the use of a proxy.

Surveys that can also be considered as supplement surveys, though of a different type, are subsequent surveys. These use rotating-out panels, so that in practice, the households have an additional interview (all of them, or only a certain sub-population, for which the screening is done by the current survey). Harm to the current survey is avoided, but, there is the fear that the subsequent survey may suffer from more refusals due to a further round of interviews. Thus, such surveys are often avoided, despite the advantages. For the same reason, the number of rounds in a current survey is limited to avoid negative effects on the response rate, although in some cases more rounds would much better fulfill the targets of the survey.

In this paper, the effect on the nonresponse of the current survey from the additional burden that is imposed by conducting supplement surveys, is examined. At the same time, some other effects are studied, such as that of the mode of data collection and of the season of the year. The assumption of a fall in the response rates with the number of rounds is examined to a limited extent. A long-term analysis of nonresponse rates in the Israeli LFS is used for this study. This survey, briefly described in section 2, is suitable since it is a panel survey and is used as a vehicle for other surveys relating to various subjects with different degrees of burden. The analysis is done for Total Nonresponse, as well as for four types of nonresponse: Refusals, Absentees, Interviewing Difficulties and Other Nonresponse. The data and the model that were used for the analysis are described in section 3. The results obtained are presented in section 4 and a summary is given in section 5.

2 The Israeli LFS

Current LFS's (and similar surveys) in many countries are conducted as rotating panel surveys. In general, the rotation system is chosen to obtain estimates of changes between successive periods (e.g. months, quarters or years) with sampling variances as low as possible, together with periodic cross-sectional estimates. This is done by considering the burden on the respondents, thus, with a limited number of repeated rounds to avoid increasing refusal rates. Different rotation systems with different numbers of rounds are used. For example, the CPS in the USA (U.S. Census 1973) is a monthly survey with eight rounds (four successive months and the same four months in the following year); the Canadian LFS (Statistics Canada 1997) is also a monthly survey with six successive rounds; and, the British survey (Steel 1997) is quarterly with five successive rounds.

In Israel, the LFS is carried out currently as a quarterly rotating panel survey with four rounds, i.e. four quarterly surveys are conducted every year, each comprising four panels. So, each quarter includes one panel investigated for the first time and one each for the second, third and fourth time. Each dwelling unit (with a few exceptions in the small localities) participates in the sample for two consecutive quarters and, after a break of two quarters, for two additional consecutive quarters (Israel CBS 1995).

The mode of data collection in LFS's is not necessarily the same in all rounds of the same panel. Usually, the first interview is face-to-face and some or all of the following interviews are by telephone (where possible). For example, in the Canadian and the British LFS's all interviews, except the first, are conducted by telephone. In the USA CPS, besides the first interview, also the fifth interview (conducted eight months after the fourth) is face-to-face, but all other interviews are by telephone. In the Israeli LFS, in general, the first interview is face-to-face, the second and third are by telephone, but for the fourth round, the interviewer visits the household for the Income Survey, regularly appended to this round.

The sample for the LFS is selected once a year for all four panels with equal final probabilities. Each panel is a sub-sample of about 2,700 dwelling units, distributed evenly over the 13 weeks of the quarter. Large localities are included with certainty and small localities, after stratification, are sampled with PPS. Within each locality, the dwellings are sampled from the municipal tax file. A sample of new dwellings is currently assigned to all panels, thus starting their investigation only in the advanced rounds of their panel.

Some dwellings may be out-of-scope (vacant, demolished, used as a business, etc.) in some or all rounds. The LFS is based on repeated investigation of the same dwelling units rather than of the same households. Thus, it is not necessarily true that the same household participates in all the eligible rounds and households that do not live in the same dwelling for the whole duration of the panel have less rounds. If there is more than one household in a dwelling, each will have at least one "blank" round. Further, new dwellings are introduced into the sample only at an advanced round, and so all rounds prior to the round in which they were inhabited are considered as "blanks". Because of two exceptional events in Israel (the Gulf War in the first quarter of 1991 that lasted for 6 weeks and, a 3-week strike of all government employees in the third quarter of 1993), the samples of two quarters had to be reduced, thus more "blanks" were introduced into the sample. On the average, in the years 1988-96, of all households, 63% were in the sample in 4 rounds, 9% were with 3, 15% with 2 and, 13% with 1.

Whenever an interview has not been conducted, a Non-Interview Form has to be filled in by the interviewer who has to state the reason (if necessary, neighbours are asked or enquiries are made locally, like at the nearest post office or grocery). This is done first, to distinguish between out-of-scope and nonresponse cases. Then, for each nonresponse, further enquiries are made to find out a detailed reason (e.g. Refusals, by who refused on which visit; Absentees, by length and reason; Interviewing Difficulties, according to language barrier, illness, incapable of cooperating; and, Other Nonresponse, due to failed telephone interview, non-location, no attempt to interview, etc.). Thus, for each household for each of its four rounds there may be one of these possibilities: (1) out-of-scope; (2) "blank"; (3) nonresponse, by detailed reason; and, (4) response.

The overall Total Nonresponse rate in 1988-96 was 10.5%. Out of this, 33% were Refusals, 43% Absentees, 12% Interviewing Difficulties and, 12% Other Nonresponse. The nonresponse rates were not the same for households with different number of eligible rounds. For the 4-round households, the Total Nonresponse rate was lower (8.1%), and out of this, the proportion was higher for Refusals (42%), lower for Absentees (36%) and Other Nonresponse (9%), and it was almost the same for Interviewing Difficulties (13%).

The nonresponse rates were higher for the 12 panels of the earlier part of the period (group {a}) than for the 14 panels of the later period (group {b}). For the 4-round households, the average rate was 9% for group {a} and 7.6% for group {b}. This could be due to difficulties in conducting the survey at a time of exceptionally large waves of immigrants arriving in the country at the early part of the period. However, the decrease in the nonresponse rates may be also due to improvements in the field work.

As in similar surveys in other countries, so too in Israel it is the practice from time to time to annex different supplement surveys to the LFS. These surveys are conducted periodically or only once, except for the Income Survey that is regularly annexed to the last round of each panel. Whenever a supplement survey is conducted, notification about it is given in the advance letters that are sent to the households for the LFS. Nevertheless, the supplement questions are always asked after the interview for the LFS, to avoid harming the LFS. Some of these supplement surveys are easy, such as the Membership in Youth Movements Survey, Kindergarten Attendance Survey, and the Multiple Jobs Survey. Others are heavier, for example, the Income Survey, the Household Equipment and Living Conditions Survey; the Use of Health Services Survey and the Victimization Survey (in the latter two, every adult member of the household has to be interviewed).

3 The data and the model used for the analysis

The data used for the analysis are from all the rounds of 26 panels that participated in the Israeli LFS in the period between 1988 and 1996. Most localities with at least 2,000 inhabitants (comprising about 80% of the sample) took part in this study. Other localities were excluded, primarily because they were rarely covered in the supplement surveys.

Up to the present, only the 4-round households, i.e. residing in the same dwelling during the whole cycle of a panel, participated in the analysis. The inclusion of households with less rounds would cause complications in the analysis. For example, it would be necessary to determine for each household if it was in the current survey both in rounds with a supplement survey and in subsequent quarters. Nevertheless, it is intended to extend the study to include households with less eligible rounds.

Altogether, 42,300 households participated, each household with its four eligible rounds - a total of nearly 170,000 observations, though not all independent.

The analysis of the effects on the nonresponse rates was done for Total Nonresponse and separately for Refusals, Absentees, Interviewing Difficulties and for Other Nonresponse, by means of a regression model:

$$p_i = \alpha + \Sigma_k \beta(k)\, X(k)_i + \varepsilon_i$$

The explained (dependent) variable p_i (i= 1,...,104) is the nonresponse rate for each of the various types of nonresponse, for 26 panels each with 4 rounds dependent on each other. $X(k)_i$ are the explanatory (independent) variables, $\beta(k)$ are the corresponding regression coefficients, α the intercept and, ε_i is the random deviation, namely the residual not explained by the regression model (where the expected value of ε_i is zero).

The explanatory variables are all dummy variables, i.e. with a value 1 if panel-round **i** has the characteristic, and 0 otherwise:

- Panel group: **X(1)** for the 14 panels in the later part of the period - group {b}.
- Quarter of the year: **X(2)** for quarter II (April-June), **X(3)** for quarter III (July-September), and **X(4)** for quarter IV (October-December).
- Round: **X(5)** for the second round, **X(6)** for the third round, and **X(7)** for the fourth round. Since in this survey, interviews in both the second and the third rounds are by telephone and, in both the first and the fourth rounds they are face-to-face, the effect of the number of rounds can be distinguished only between rounds of the same interviewing mode.

- Supplement survey is annexed: **X(8)** when easy, and **X(9)** when heavy. For this study, each supplement survey was determined to be easy or heavy according to several judgemental criteria, e.g. the length of the annexed questionnaire, the sensitivity of the questions, the possibility of getting the required data by proxy against personal interview.
- Quarter following supplement survey, for a given panel: **X(10)** when following an easy survey, and **X(11)** when following a heavy survey. This variable was included to find out if there is any effect on the nonresponse rate, resulting from the reaction of the respondents to the burden imposed on them in the previous interview.
- The intercept α corresponds to group {a}, in quarter I, in its first round, with no supplement survey (and, by definition, cannot be after a supplement survey).

The simple regression model can be presented as $\mathbf{P=XB+E}$, where, **P** is the vector {104*1} of $\mathbf{p_i}$ corresponding to each panel-round **i**, **X** the matrix {104*12} of $\mathbf{X(k)_i}$ each row for each panel-round **i**, **B** the vector {12*1} of β**(k)** of the explanatory variables **k** and the intercept, and, **E** the vector {104*1} of the ε_i for each panel-round **i**. With this, unbiased estimates of the coefficients can be obtained. But, in order to test their significance, in the case of dependence between the observations, it is necessary to use adjusted variances of the regression coefficients. This is done by means of $\mathbf{Var(B)=(X'X)^{-1}X'VX(X'X)^{-1}}$, where, **V=Var(E)** is a non-diagonal variance-covariance matrix of the random deviations (for example, see Greene 1993, Ch. 15).

For a preliminary view of the various effects, a simple regression model was used, where all the explanatory variables participated and, the adjusted variances of the regression coefficients were used to test their significance. However, to obtain an appropriate model, based only on explanatory variables with significant coefficients (for a given level), stepwise procedures can be used. In our case, because of the dependence between observations, a simple stepwise regression procedure is not suitable. Thus, a generalized stepwise regression was used, where at the outset, the dependence between repeated investigations of the same panel is taken into account. The generalized regression is performed using the following transformation (Draper and Smith 1966), by means of the matrix **V**:

$$\mathbf{V^{-1/2}\,P = V^{-1/2}\,X\,B + V^{-1/2}\,E}$$

Using the generalized stepwise regression, the "best" model was determined for each nonresponse type separately, based only on explanatory variables with 5% significant coefficients (a 10% level did not make any difference). The models were similar but not the same for all nonresponse types. For the sake of consistency, the estimates of the

regression coefficients for the nonresponse types should sum to those corresponding to the Total Nonresponse. Therefore, one common model, that contained all explanatory variables which participate in at least one stepwise model, was used for all nonresponse types. Then, the regression coefficients for the common model were estimated by using simple regressions. With generalized regression it is possible to predict nonresponse rates for a given panel-round, according to its characteristics and its previous round (this is not, however, the primary aim of this study). To obtain estimates of the effects on nonresponse (which is the goal of this study), a simple regression is more suitable. To examine the significance of these estimates, standard errors were computed, separately for each type of nonresponse, with the required adjustment for the dependence between the observations.

4 The results

In the common model, as explained in section 3, only explanatory variables that were significant for at least one nonresponse type were incorporated, namely, those representing:

- The burden arising from adding a heavy supplement survey.
- All the rounds.
- Only quarter III.
- Panels of the later part of the period - group {b}.

The other explanatory variables, which were not significant for any of the nonresponse types, did not participate, representing:

- The burden arising from adding an easy supplement survey.
- The effect of any supplement survey on following investigations, even if heavy.
- The quarters, except from quarter III.

The results for each nonresponse type, as obtained by the simple regressions based on the common model, are presented in Appendix I. Since a common model was used, not all effects are significant for each type separately. The unshaded β's are significant at 5% level (most of them with a p-value close to zero). A few with lighter shading are hardly significant at $5\%<p\leq 10\%$ level and, the rest (most of them with a very high p-value) have dark shading.

It should be mentioned that the $\mathbf{R^2}$ (measuring the fit of the model) are quite high: 0.69 and 0.75 for Total Nonresponse, with and without Other Nonresponse, 0.55 for Refusals, 0.67 for Absentees, 0.73 for Interviewing Difficulties and, for Other Nonresponse, it is only 0.39.

Comparisons between the predicted rates, as derived from the regression model, for each of the four types under the conditions of panel group {b}, are presented in Appendix II. It should be emphasised that these estimates are based on all variables that took part in the common model, thus not all the differences between the predicted rates are significant. Even so, they give some idea of the general behaviour of the different types of nonresponse.

4.1 Refusals

The overall refusal rate for the whole period was 3.4%, higher (3.6%) for the earlier panels and lower (3.3%) for the later panels, though the difference is not significant.

- Contrary to common belief, the results show no effects on the refusal rate in the LFS due to the burden stemming from supplement surveys, even if heavy. The same is true for cooperation in the following investigations (as in Sharp and Frankel 1983).
- Further, the results show no increase in the refusal rate with the number of round for a given mode of interviewing - face-to-face or telephone. On the contrary, the refusal rate in the third round is significantly lower than in the second (β=-1.1 and β=-1.4), and no significant increase is found in the fourth round from the first (there may even be a slight fall). Thus, from this study, there is no evidence to support the assumption that a greater number of rounds leads to a higher refusal rate. However, this is for a limited number of rounds and may not be true for more rounds.
- There are no significant differences in the Refusals rate between the quarters, as would be expected.
- The results show considerable effects for the second and the third rounds. Compared to the first round, where the average refusal rate is about 4.0% (in group {b}), there is a reduction of 28% in the second round and of 35% in the third. More refusals in the first round can be explained by the difficulties associated with introducing a new sample, so that the interviewer invests less effort to persuade the more stubborn refusals. However, no significant effect is found for the fourth round vis-a-vis the first. Thus, it is reasonable to believe that the effects are of the mode of data collection. More persistent attempts can be made by telephone to gain an interview, as it is much easier and cheaper than conducting more visits to the respondent's house. A reduction of refusals rates by telephone interviews may, however, be true only when the first contact with the respondent is done by a face-to-face interview.

4.2 Absentees

The overall Absentees rate for the whole period was 3.0%. A significant difference is found between the earlier and the later parts of the period: 3.4% for group {a} and 2.6% for group {b}. As was pointed out in section 2, this can be explained, either by the special difficulties in conducting the survey at the time of very large waves of immigration, or by improvements in the field work. In both cases, this is more likely for Absentees rates than for Refusals, as the results show.

- There is room for thinking that there will be some effect on Absentees rate from the heavier workload of the interviewers arising from the extended interviews required for a heavy supplement survey. This may not allow them to devote sufficient time for repeated visits to absentees, since they have to complete their quota in the same time as in other quarters. The results indicate some increase (β=+0.3), though not significant.

- Although it would be reasonable to assume that Absentees rate would increase in the summer months, the results show only a small and hardly significant regression coefficient relating to quarter III (β=+0.3 with **p=7%**). In Israel, besides the summer holiday, there are two other holiday periods each year. Thus, there is the tendency to spread vacations over the year and vacations are usually not that long. Because the holidays are determined by the Hebrew calendar, one is usually in quarter II but may be sometimes in quarter I and, the other may be either in quarter III or IV. In addition, in the Israeli LFS, it is permitted to make use of a proxy, to postpone the interview to a subsequent week and the interviewer leaves a questionnaire for absentees to return by post. Thus, for Israel, the results obtained are reasonable, but it could be that in other countries absentees rates would be higher in the summer months.

- It is not surprising that Absentees rate in the telephone rounds is significantly less than in face-to-face rounds (β=-1.4 for the second round and β=-1.7 for the third). The results show that the interviewing mode is more meaningful for Absentees than for Refusals: a reduction of about 40% in the second round and of about 50% in the third, as compared to the other two rounds, where the average rate is 3.3% (in group {b}).

4.3 Interviewing Difficulties

Interviewing difficulties are mostly due to problems in conducting the interview either due to language difficulties or to physical or mental illness. Although these stem from limitations of the respondents, the resulting nonresponse will depend also on the interviewer effort invested to hold an interview. The overall nonresponse rate was 1.0% for the whole period, and, similar to Absentees, a significant difference is found between the earlier and the later parts of the period: 1.1% and 0.9%, respectively.

- This is the only nonresponse type, for which "almost" a significant effect of heavy supplement surveys can be detected (β=+0.2 with **p**=7%). Maybe, since these cases are the most difficult to interview, the interviewer gives up when he is too busy.
- The results show a significant effect of quarter III for Interviewing Difficulties (β=+0.1), whereas for Absentees there is only some indication (not definitely significant). The explanation for this lies possibly in the extra workload of the interviewer which cannot be reduced by postal questionnaires or postponements, as for Absentees.
- For this nonresponse type, the fall in the two telephone rounds is most substantial (β=-0.9). When compared to the first round, this is a reduction of about 70%. Language problems can be solved in telephone interviews by using interviewers able to converse in the language of the immigrants, whereas in face-to-face interviews this would considerably increase the cost, because the immigrants are spread all over the country. As for the other reasons of this nonresponse type, more contacts may yield a successful interview with another member of the household who would be capable of providing the required information, and, this is easier by telephone.

4.4 Other Nonresponse

This nonresponse type is different from the others in that it is hardly dependent on the respondents or the interviewers. Part stems from unsuccessful attempts to interview by telephone (mostly for technical reasons), part from non-location arising from deficiencies in the sampling frame and the rest from organizational problems. The overall rate was 0.7% with only a slight decrease (not significant) in the later period. Except for the rounds, none of the other effects are significant.

- In contrast to all the previous types of nonresponse, where there is a substantial decrease in the rates in the telephone rounds, for Other Nonresponse there is a significant increase in both the second and the third rounds (β=+0.4).

- Against all nonresponse types, for Other Nonresponse, a significant decrease is found in the fourth round (β=-0.3). This is probably since there are no telephone problems in the fourth round and, many of the non-location problems have already been solved in the meantime.

Thus, the effects of the rounds follow a completely different pattern for this nonresponse type: it is the highest in both the second and the third rounds (1.0%), it is less in the first (0.6%), and the smallest (0.3%) in the fourth round.

4.5 Total Nonresponse

The overall Total Nonresponse rate was 8.1% for the whole period, 8.9% for the early period and 7.5% for the later period, and the difference (β=-1.4%) is significant. This is due mostly to Absentees and to Interviewing Difficulties.

- The effects of the second and the third rounds for all the nonresponse types, except for Other Nonresponse, are all significant and of the same direction. Thus, a considerable fall is observed in the Total Nonresponse for telephone interviews with a larger decrease in the third round than in the second (β=-3.0 and β=-3.7, respectively). When Total Nonresponse without Other Nonresponse is considered, the effects are even greater (β=-3.4 for the second round and β=-4.1 for the third), due to the rounds effects for Other Nonresponse being in the opposite direction. This constitutes about a 40% and 50% reduction of the Total Nonresponse in the second and the third rounds, respectively, as compared to average rate in the first and the fourth rounds (8.6%, as in group {b}).

- For all the nonresponse types, the effect of quarter III is small, and is significant only for Interviewing Difficulties, hardly for Absentees and not significant for the other two types. For Total Nonresponse, there is some indication of a small increase in quarter III, though not significant (β=+0.6 with **p**>16%).

- For Total Nonresponse, as for all nonresponse types separately, both the effects of burden from a heavy supplement survey and of the fourth round are not significant. It should be noted that these effects are in opposite directions and cancel out (however, only to some extent, when Other Nonresponse is excluded), probably because of the high correlation between them due to the Income Survey.

5 Summary

The aim of this study was primarily to examine if there is an increase in nonresponse of a current panel survey, when supplement surveys are annexed:

- For Refusals, contrary to common belief, the results show no effect whatsoever from the extra burden, even when adding a heavy survey, nor on cooperation in investigations that follow supplement surveys.
- Despite the negative effect that may be expected because of the interviewer's additional workload, no significant effect is found for Absentees and, only a very small effect (hardly significant) is detected for Interviewing Difficulties.

The issue of the burden on respondents arising from repeated interviews and the effect on the nonresponse rate, was examined, however, to a limited extent:

- Empirically, for the case of four rounds, no evidence is found to support the assumption of increasing refusal rates with a greater number of rounds. On the contrary, refusal rates decrease significantly in the third round vis-a-vis the second, and a slight fall is indicated for the fourth round against the first.
- Although not discussed in this paper, it should be mentioned that, the same applies to subsequent surveys that make use of the rotating-out panels. For various subsequent surveys in Israel, the refusal rates were similar to that of the LFS.

As for the expectation of more Absentees in the summer months:

- There is some indication of an increase in the Absentees rate in quarter III, though not significant. This may be specific to Israel and may not be true in other countries.

The outstanding finding of this study, is the substantial differences in the nonresponse rates, of all types, between telephone rounds and face-to-face rounds:

- For all nonresponse types, except for Other Nonresponse, the rates are considerably lower in the telephone rounds. For Other Nonresponse they are higher in the telephone rounds, as explained above.

Although the primary purpose of this paper was not to study the effects on the response rate of telephone vis-a-vis face-to-face interviews, the findings suggest quite strongly that nonresponse, of all types, are more affected by the way the interviews are conducted. The ability of the interviewers to cope with the extra workload and their constraints of time and cost to make more visits to hard-to-get respondents, probably play an important role, especially when face-to-face interviews are conducted.

Finally, it should be mentioned that the results obtained from this study may not be conclusive and may not give a complete picture:

- The findings brought here relate only to the 4-round households that did not change their place of residence for the entire duration of the panel. As mentioned in section 2, higher nonresponse rates are associated with households with less eligible rounds and, besides, their nonresponse patterns may be substantially different from that of the 4-round households (Kantorowitz 1994). Therefore, it is planned to extend the study to include households with less than four eligible rounds, although this may cause some complications in the analysis. As for the exclusion of small localities (with less than 2,000 inhabitants) as explained in section 3, this should not influence the main conclusions derived from this study.

- This study was based on a macro analysis of the nonresponse rates. A micro analysis, in addition, could contribute to a better understanding of the effects on nonresponse. Such analysis would be based on households, taking into account also their characteristics and also their responding profiles for the whole duration of the panel, i.e. always respond, respond but not always and, never respond, by the reason for not responding.

- Further analysis of the nonresponse in supplement (or subsequent) surveys is required for a more conclusive policy whether they should be annexed to a panel survey, or conducted separately.

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Appendix I

Regression Coefficients for the Common Model

(percentages)

Explanatory Variables				β	s.e.	p-value	β	s.e.	p-value
Panel group	Quarter	Round	Supplement survey	Refusals (R^2=0.55)			Absentees (R^2=0.67)		
(a)	I	1		4.29	0.27	0.000	4.00	0.22	0.000
(b)				-0.35	0.26	0.181	-0.81	0.18	0.000
	III			0.14	0.21	0.510	0.32	0.18	0.066
		2		-1.10	0.17	0.000	-1.41	0.16	0.000
		3		-1.44	0.18	0.000	-1.71	0.17	0.000
		4		-0.28	0.54	0.607	-0.08	0.52	0.871
			Heavy	0.01	0.41	0.971	0.35	0.36	0.332
Panel group	Quarter	Round	Supplement survey	Interviewing Difficulties (R^2=0.73)			Other Nonresponse (R^2=0.39)		
(a)	I	1		1.46	0.07	0.000	0.62	0.05	0.000
(b)				-0.19	0.05	0.000	-0.09	0.05	0.063
	III			0.14	0.06	0.016	0.02	0.04	0.562
		2		-0.87	0.07	0.000	0.35	0.04	0.000
		3		-0.91	0.07	0.000	0.37	0.05	0.000
		4		0.02	0.21	0.908	-0.30	0.11	0.008
			Heavy	0.22	0.12	0.072	0.07	0.11	0.524
Panel group	Quarter	Round	Supplement survey	Total Nonresponse Incl. Other Nonresponse (R^2=0.69)			Total Nonresponse Excl. Other Nonresponse (R^2=0.75)		
(a)	I	1		10.37	0.60	0.000	9.76	0.55	0.000
(b)				-1.44	0.61	0.018	-1.36	0.55	0.014
	III			0.63	0.47	0.184	0.60	0.43	0.159
		2		-3.03	0.33	0.000	-3.38	0.30	0.000
		3		-3.68	0.38	0.000	-4.06	0.36	0.000
		4		-0.64	1.22	0.602	-0.34	1.13	0.767
			Heavy	0.66	0.93	0.480	0.58	0.83	0.483

Appendix II

Predicted Nonresponse Rates in Group {b}, by Rounds, Quarters and Burden due to Heavy Supplement Survey